QAPP

QA/QC Plan

Phase IV Remedial Action Self-Implementing Clean-up and Disposal

Aquarion Former Strawberry Hill Water Tank Site
39 Prospect Avenue
Hull, Massachusetts

Prepared for:
Aquarion Water Company

July 2015

Environmental Partners GROUP
A partnership for engineering solutions

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1.0 INTRODUCTION

1.1 Introduction

Environmental Partners Group, Inc. (Environmental Partners) on behalf of Aquarion Water Company of Massachusetts (Aquarion) is conducting a Phase IV Remedial Action at the Aquarion Strawberry Hill Former Water Tank Site located at 39 Prospect Avenue in Hull, MA. This work is a continuation of remedial activities that were discussed with EPA in a meeting on February 4, 2013 and performed at the site in summer and fall 2013. The Remedial Action is being conducted under a Self-Implementing Cleanup and Disposal.

The Aquarion Strawberry Hill Former Water Tank Site is an approximately 13,080 square feet (0.30 acres). Environmental Partners, on behalf of Aquarion will be performing a Phase IV Remedial Action to excavate and dispose offsite up to 2,200 cubic yards (cyds) of PCB impacted soils from the top 24 inches of material. The source of PCBs in the soil appears to be from paint on the water tank that was dismantled in 2009, with higher PCB concentrations located closer to the former water tank structure and lower concentrations further away.

In support of performing a Self-Implementing Remedy (MassDEP Phase IV Remedial Action), Environmental Partners has submitted to EPA the following reports:

Phase II Comprehensive Site Assessment/Phase III Remedial Action Plan Report dated January 2014;

Class A-2 Response Action Outcome (RAO) Statement 37 Prospect Avenue (abutting property to the north) dated January 2014; and

Phase IV Remedy Implementation Plan (RIP) dated February 2015 and revised July 2015.

As required under (§761.61(a)(3)), Environmental Partners has prepared this QA/QC plan for documenting that the cleanup levels have been achieved (i.e., confirmatory sampling/analysis QA/QC). This QA/QC plan documents the types and numbers of samples; extraction/analytical methods; MS/MSD (frequency and acceptance criteria); and data validation methods.

1.2 Project and Task Organization

1.2.1 Project Quality Assurance Manager

The Project Quality Assurance (QA) Manager for this project is Paul F. Gabriel, P.E., LSP. The Project QA Manager is responsible for ensuring the quality of the work conducted under the Self-Implementing Cleanup and Disposal. The QA Manager is responsible for ensuring that all work is performed in accordance with this Quality Assurance/Quality Control (QA/QC) Plan. Specific responsibilities of the Project QA Officer include:

- Conduct performance and system audits to verify compliance with QA procedures
- Review all documents with respect to adherence to QA procedures
- Recommend and institute corrective actions based on reviews and audits
- Oversee subcontractor QA/QC procedures

1.2.2 Project Manager

The Project Manager for this project is Ann Marie Petricca, C.P.G. The project manager will be responsible for the overall technical direction of the project and communicating the progress and quality of the work with the regulatory agencies and with Aquarion. The Project Manager is also responsible for ensuring that all work is performed in accordance with the Phase IV RIP. The project manager will review all technical documents for accuracy and completeness with respect to the Phase IV RIP and overall QA/QC. Specific responsibilities of the Project Manager include:

- Coordinating and implementing Phase IV activities
- Coordinating and communicating with the regulatory agencies
- Coordinating project personnel, staff and subcontractors
- Ensuring project objectives are achieved
- Managing project schedule
- Technical guidance
- Completing project deliverables
- Ensuring that corrective actions of QA/QC concerns are addressed

1.2.3 Field Sampling Project Manager

The Field Sampling Project Manager for this project is Stephen J. Gabriel. The Field Sampling Project Manager is responsible for execution and management of onsite activities, including:

- Ensure that field activities are conducted in accordance with the Phase IV RIP, QA Plan, and HASP
- Documentation of field activities and procedures
- Coordination, management and oversight of field personnel and subcontractors
- Communication with the Project Manager

1.2.4 Laboratory Personnel

Laboratory samples will be analyzed by ESS Laboratory in Cranston, RI, a Massachusetts State Certified Laboratory. The Laboratory Project Manager for this project is Ms. Elizabeth Ouk and Laboratory Quality Assurance Manager is Jim Badger. The responsibilities for these individuals are as follows:

The Laboratory Project Manager will coordinate with the Project Manager, Field Sampling Project Manager or Quality Assurance Officer on issues relating to bottles, scheduling, analyses, sample receipt, sample integrity and data reports.

The Laboratory Quality Assurance Manager is responsible for implementing all laboratory QA/QC procedures, conducting internal system and performance audits, and overseeing corrective actions, as required.

1.3 Problem Definition and Background

Site contaminants with soil concentrations exceeding TSCA standards for PCBs and Massachusetts Contingency Plan (MCP) 310 CMR 40.0975(6)(a) Method 1 S-1/GW-2/GW-3 standards include:

- PCB's,
- metals (arsenic, cadmium, chromium and lead),
- total petroleum hydrocarbons
- semivolatile organic compounds (2-methylnaphthalene, acenapthene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd) pyrene, phenanthrene), and
- C11-C22 Aromatic Hydrocarbons

PCB concentrations in soil also exceed TSCA levels for unrestricted use (1 mg/Kg). In general, concentrations of contaminants exceeding Method 1 S-1/GW-2/GW-3 and TSCA levels for unrestricted site use are limited vertically to the top two feet of soil and are consistent with the presence of fill. The horizontal extent of contaminants in soil with concentrations exceeding RCS-1 Concentrations are largely confined to within the fenced area of 39 Prospect Avenue, although these contaminants extend approximately 5 feet to the east and west of this fenced area. The highest concentrations of PCBs were in the vicinity of the former water tank site. The goal of the Phase IV Remedial Action is to remediate contaminated site soils to below MCP Method I Risk Characterization cleanup standards for unrestricted site use (i.e., Soil Category S-1/GW-2 and S-1/GW-3) and PCB concentrations less than TSCA cleanup levels for unrestricted site use (i.e., 1 mg/Kg).

The selected site remedy consists of the following elements:

- Excavating areas on Site where PCBs were detected above 50 mg/kg (See Figure 1 for locations, approximately 106 tons) for disposal at a TSCA facility.
- Excavating the remainder of the Site as shown on Figure 1, to an average depth of 18 to 24 inches (approximately 1,618 tons) for disposal at an out-of-state lined landfill;
- Collection of confirmatory soil analyses for laboratory analysis; and
- Replacing the excavated soil with clean fill and topsoil to match existing grade.

1.4 Project/Task Description

In accordance with the Phase IV RIP, post-excavation confirmatory soil sampling will be performed in each excavated area, prior to excavating the next area, in order to minimize having to transit clean areas of the site with contaminated equipment. Extensive soil characterization has been performed at the site in support of the Phase IV remedy. Soils will be excavated to average depths of 18 to 24 inches below grade. Extensive sampling of soils for PCBs was performed at the Site under the Phase 2/Phase 3, on 5-foot, 10-foot and 20 foot grid spacing, based on verbal guidance from EPA Region 1 (Tisa, 2013). Field screening and field test kits may be used to initially confirm that the limits of impacted soils have been excavated, prior to submitting samples for confirmatory laboratory analysis (i.e., screening for PCB concentrations with Dexsil Chlor-n-soil test kits or Hach Colorimetric Test Kit).

Laboratory analysis of composite soils samples will be used to confirm that excavation of contaminated soils has achieved performance standards for unrestricted use of the property

(TSCA PCB standards for unrestricted site use and Method 1 S-1/GW-2/GW-3 standards for other contaminants of concern), as follows:

- PCBs < 1 mg/Kg
- Chromium(III) < 1000 mg/Kg
- Chromium(VI) < 30 mg/Kg
- Lead < 200 mg/Kg
- Benzo(a)pyrene < 2 mg/Kg

EPA allows for compositing soil samples if the site is sufficiently characterized with a maximum of nine samples per composite. Figure 2 is a diagram of how composite soils samples will be collected. Excavation and confirmation sampling may be an iterative process. After initial confirmation samples are analyzed, additional excavation may be necessary to achieve performance standards. The estimated number of soil confirmation samples to be submitted to an offsite DEP certified laboratory is as follows:

PCBs – 46 samples

EPH – 20 samples

RCRA 8 Metals – 20 samples

If contaminant concentrations from the composite samples are above these standards after completion of all excavation activities, then an AUL will be recorded for the property, specifying activities and uses that are allowed or prohibited at the disposal site in the future.

2.0 QUALITY OBJECTIVES AND CRITERIA

2.1.1 Project Quality Objectives and Measurement Performance Criteria

The purpose of the QA Program is to identify the quality objectives for the Phase IV and the performance criteria needed to meet those objectives and performance criteria. This evaluation is developed on two levels: (1) the decision level and (2) the measurements used to support the decision level. The performance and acceptance criteria are expressed in terms of Data Quality Indicators (DQIs), with the principal indicators of data quality being precision, accuracy, representativeness, completeness, comparability, and sensitivity (PARCCS). The objectives for these quality indicators are developed in this section. Measurement quality objectives (MQOs) are the acceptance thresholds for the Phase IV Remedial Action data, based on each analyte.

QA/QC samples will be collected and analyzed in the event data evaluation is required. Data quality and quantity are measured through comparison of results with established acceptable limits for data PARCCS indicators. Following is a discussion of these Data Quality Indicators (DQIs).

A. Precision – Precision is a quantitative measure of the reproducibility of data or measurements that have been made in an identical fashion. Precision is usually measured in terms of relative percent difference or relative standard deviation. Precision is dependent on both the sampling technique and the analytical method. QC samples collected to evaluate precision will include field and laboratory duplicate samples, and matrix spike and matrix spike duplicate/duplicate recoveries. QC samples will be collected at a frequency of one per SDG (20 samples) per matrix. QC samples will be analyzed for the same parameters as other samples in the SDG.

   Precision is generally measured by comparing the results for duplicate samples. To estimate precision, the relative percent difference between the sample and the duplicate is determined, as follows:

$$RPD = \frac{2x\ (Sample\ A - Sample\ B)}{(Sample\ A + Sample\ B)} \times 100$$

Where:

RPD = Relative Percent Difference
Sample A = the original sample
Sample B = the duplicate sample

B. Accuracy/Bias – Accuracy is a quantitative measure of system bias that may result from sampling or analytical error. Factors that may contribute to accuracy problems include sampling inconsistencies, sample preservation and handling, laboratory error, laboratory or field contamination. QC samples collected to measure accuracy for project samples include field blanks and matrix spike sample recoveries. In addition, Laboratory Control Samples (LCS) will be analyzed to measure accuracy/bias of analytical data. Field blanks will only be collected in situations in which non-dedicated sampling equipment is used. QC samples will be collected at a frequency of one per 20 samples per matrix. QC samples will be analyzed for the same parameters as other samples in the SDG.

Accuracy measures the degree of agreement between a measurement and an accepted true value. Accuracy is measured by determining the percent recovery for spike samples. This is done through evaluation of LCS, surrogate spikes, and matrix spikes, as follows:

$$\%\ Recovered = \frac{measured\ concentration}{Actual\ concentration\ spiked} \times 100$$

For matrix spike samples, the corrections for background concentrations found in the unspiked fraction are made as follows:

$$\%\ Recovered = \frac{(spiked\ result - background)}{Concentration\ of\ spike\ added} \times 100$$

Control limits are set for the evaluation of % recovered as the mean ± standard deviations. Warning limits are at the mean ± 2 standard deviation units.

C. Representativeness – Representativeness is a qualitative characteristic that expresses the degree to which the sample data reflects specific characteristics of the media from which the sample was collected. Parameters, site selection (including sample location), and frequency of sample collection can all play a role in determining the representativeness of a sample. QC samples collected to measure representativeness for project samples include field duplicates. QC samples will be collected at a frequency of one per 20 samples per matrix. QC samples will be analyzed

for the same parameters as other samples in the SDG. The Phase IV RIP provide standardized sampling and analysis procedures to ensure sample collection and data generation are representative.

D. Completeness – Completeness is a quantitative measure of the amount of valid or usable data the program originally intended to collect versus how much was actually collected. Deficiencies in the data set may be due to sampling techniques, poor accuracy or precision, or laboratory error. Deficiencies may affect certain aspects of the data, but usable data may still be obtained from these samples. The completeness of the data set is of high importance for documenting achievement of soil cleanup levels for unrestricted use.

The measurement of completeness is calculated by comparing the amount of valid data obtained with the total amount of data that was expected under normal conditions. Completeness for each set of samples is calculated as follows:

$$\% \text{ Completeness} = \frac{\text{number of valid sampled obtained}}{\text{total data needed}} \times 100$$

Samples are not considered valid if an error occurred in the analysis that makes the data suspect or if the QC recovery for a sample was unacceptable.

Completeness is evaluated for each media sampled in terms of the overall data collected and "critical data," as needed for Project Quality Objectives (PQOs). Overall data is all data collected for that media. The only "critical data" identified are as follows:

1. Laboratory analysis of composite soils samples to confirm that excavation of contaminated soils has achieved performance standards for unrestricted use of the property;
2. Analysis of wipe samples to confirm equipment leaving the site does not impact offsite areas.
3. Analysis of decontamination water for discharge to the ground surface in non-remediated areas of the site

The completeness goal for the "critical data" is 90%. All other data have a completeness goal of 80% (field and laboratory data).

E. Comparability – Comparability is a qualitative expression of the confidence with which one data set can be compared to another. In order for data sets to be comparable, precision and accuracy must be within appropriate QC limits. Analytical data will be comparable when similar sampling and analytical methods are used for collection of the data. Comparability of the Phase IV RIP data will be achieved by following the sample collection plan as presented in Figure 2, using standard EPA methods for analysis, and by evaluating the validity and usability of the data using standard procedures and QA/QC criteria defined in this QA Plan.

F. Sensitivity – Sensitivity documents the ability to achieve specific quantitation limits. Data sensitivity can be affected by highly contaminated samples or matrix interference. Quantitation limits for analyses scheduled to be performed for soil, decontamination water and wipe samples are presented in Section 4.4 Table 1.

3.0 A9. DOCUMENTS AND RECORDS

In order for data to be useful, a data management program must be maintained throughout the project. QA procedures for field samples require appropriate documentation of all field sampling activities. All field activities will be documented in a weatherproof bound logbook with waterproof ink. Information to be recorded should include at a minimum, the following items:

- Names of personnel onsite and any visitors that come onto the site
- Weather conditions for the day and at the time of sample collection, including precipitation, temperature, winds etc.
- General description of site activities
- Sample collection documentation, which should include the following items:
  - Sample location and description
  - Sample designation
  - Date and time of sampling
  - Sample matrix and type
  - QA/QC samples
  - Laboratory analyses to be performed
  - Sample preservation
  - Decontamination procedures
  - Field measurements collected
  - Instrument checks, calibration and maintenance activities
  - Changes in sampling protocol from the PDI Work Plan, FSP or QAPP and reason for change

In addition to documenting field activities in a logbook, digital photographs may be collected to document field sampling locations, field operations and procedures, or site conditions. Photographs will be documented in the logbook and will include the following information.

- Photo number
- Date and time
- Subject of photograph and significant features
- Location and direction of photograph (i.e., view towards the north)

Sample Labels will be attached to all sampling containers submitted for analysis. Labeling is discussed in more detail in Section 2.0.

Chain of Custody (COC) forms will accompany all samples from collection sites to the Laboratory. The COC will be signed by the sample collector and all individuals who gain custody of the samples until arrival at the laboratory. Information on the COC will be consistent with the label information on the sample containers.

At the end of the Phase IV RIP field program, the field logbook notes and field data sheets will be scanned to a PDF file and stored to protect from loss or damage. All analytical data will be stored in an electronic format (Excel and PDF). A project database will be maintained ensure that the data is organized and protected from loss and damage.

4.0 DATA GENERATION AND ACQUISITION

This section addresses data generation and acquisition to ensure that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are employed and documented. This section includes a discussion of methods for the collection, handling, and analysis of samples; data obtained from other sources (i.e., contained in a computer data base from previous sampling activities, compiled from surveys, taken from literature etc.); and data management (i.e., compiling, handling) of the data.

4.1 Sampling Process Design (Experimental Design)

The sampling program for the Phase IV RIP includes collection of soil samples to document that cleanup standards for unrestricted site use have been achieved. This section discusses the design and rational for the sampling program.

4.1.1 Soil Characterization

Laboratory analysis of composite soils samples will be used to confirm that excavation of contaminated soils has achieved performance standards for unrestricted use of the property (TSCA standards for PCBs and Method 1 S-1/GW-2/GW-3 standards for other contaminants of concern), as follows:

- PCBs < 1 mg/Kg
- Chromium(III) < 1000 mg/Kg
- Chromium(VI) < 30 mg/Kg
- Lead < 200 mg/Kg
- Benzo(a)pyrene < 2 mg/Kg

If soil samples are collected with non-dedicated equipment, then an equipment blank will be collected to document adequacy of decontamination procedures.

4.2 Sampling Methods

Composite soil samples will be collected in accordance with EPA criteria for non-point source PCB contamination. The Phase IV RIP provides detailed descriptions of the objectives and rationale for the

sampling program and document sampling procedures that will be followed for Phase IV Remedial Action. This section discusses sampling procedures specifically as they apply to DQIs.

Proper sample collection, management, and custody procedures are necessary to ensure sample integrity and enable easy tracking of samples at all times. Proper field sample management will insure against the potential for external or cross contamination. Proper logging and handling of samples will allow for:

- Easy tracking of samples;
- Ensure each sample has a unique identification;
- Minimal loss of samples from breakage; and
- Proper preservation and analysis of samples.

4.3 Sample Handling and Custody

4.3.1 Sample Labeling, Handling and Shipment

Following sample collection, a self-adhesive label will be prepared using a permanent waterproof pen and affixed to each container. The sample label will contain the following information:

- Laboratory name
- Site name
- Sample identification name
- Sample date and time
- Sampler's initials
- Analyses required
- Preservatives added

Soil, decontamination water, and wipe sample bottles will be sealed in air-tight ziplock bags and placed immediately into a cooler packed with ice. Each sample will be given a unique sample identification name.

Samples will be transported from the site to the laboratory by an overnight priority express service (e.g., Fed Ex) or courier service. Sample holding times and preservation limitations will determine the frequency of sample shipment. All samples will be shipped under proper chain-of-custody protocols.

4.3.2 Sample Container Preparation, Preservation and Holding Times

The Field Sampling Project Manager is responsible for ordering and managing bottle shipments. Sample bottles will be supplied by the laboratory and will be certified pre-cleaned. Chemical sample preservatives (i.e., HCl etc.) will be added by the laboratory prior to shipping the sample containers. Ice or ice packs will be used to preserve samples, as necessary.

If any sample bottles appear to have been tampered with or have residue, then the bottle will be discarded and other bottles in that lot will be checked for evidence of tampering or contamination.

4.3.3 Preparation of Sampling Equipment and Containers

Decontamination Procedures

To prevent cross contamination of samples, non-dedicated sampling devices will be decontaminated between sampling points. Equipment to be decontaminated during the project will include monitoring equipment and sampling equipment. Decontamination of sampling equipment and tools following the self-implementing decontamination procedures in 40 CPR 761.79(c)(2), which include the double wash/rinse procedure. Additional decontamination procedures are outlined in the below and discussed below and in Section 5.12.2 of the Phase IV RIP.

Water Source

Potable municipal water and commercial-grade distilled water or laboratory grade de-ionized water will be used for decontamination of sampling equipment (e.g., sampling equipment and exterior surfaces of sample bottles and monitoring instruments).

Sample Containers

Exterior surfaces of sample containers will be cleaned prior to shipping offsite to prevent potentially contaminated residues from leaving the site, and to protect the health and safety of laboratory personnel who may contact sample containers. Aqueous or sediment filled sample containers will be wiped with a paper towel and rinsed with distilled or potable water. All samples will be packed in zip lock bags prior to shipment. Sampling equipment will be wiped down with a paper towel to remove any dirt or dust.

Monitoring and Sampling Equipment

If confirmatory sampling equipment is non-dedicated, then the sampling equipment will be decontamination in accordance with self-implementing decontamination procedures in 40 CFR 761.79(c)(2), which include the double wash/rinse procedure in 40 CFR Part 761, Subpart S as follows:

1. Wipe or brush off lose material.
2. Wash the equipment by rinsing and wiping the equipment with a solvent solution.
3. Rinse the equipment with a potable water and distilled water.
4. Repeat steps 2 and 3.
5. Properly dispose of decontamination fluids

4.3.3.1 Field Activities Sample Custody.

Chain-of-Custody (COC) Procedures

The COC form will accompany sample containers in the field, and during transit of samples from the field to the laboratory, until the samples are logged in at the laboratory. COC forms will be completed in the field at the time of sample collection by the field team. COC forms will be sealed in an air-tight zip lock bag to protect them from moisture, and the zip lock bag will be taped to the inside cover of the sample cooler.

Custody Seals

If the sample cooler or containers are shipped directly and the container is not equipped with a padlock, a custody seal will be signed and affixed to the cooler across the lid. The custody seal will be placed so that it would be obvious if the container were opened during shipping. Clear tape will be placed over the custody seal to ensure the seal is not accidentally torn. Custody seals will be used when shipping sample bottles to and from the laboratory.

Sample Storage and Shipment

If samples are stored onsite, they will be secured in a field office. Generally, samples will be either delivered directly to the laboratory by the field sampling team or picked up by an overnight courier service. If neither of these shipping methods is feasible, then the samples will be shipped via priority overnight delivery (e.g. Fed Ex). Prior to sending the samples, the Field Sampling Project Manager will inform the Laboratory Project Manager of the number of samples being shipped, analyses required, and the method of shipment.

Laboratory Sample Custody

At a minimum, the laboratory will be required to comply with the following sample custody protocol.

- Laboratory sample control personnel will check the sample chain-of-custody against the samples received, verify the condition of the samples and sign the chain-of-custody. If there is a discrepancy between the chain-of-custody and sample bottles, then the laboratory will notify the Field Sampling Project Manager immediately.
- At sample login, the laboratory will assign a unique sample identification number that will be used to track the sample. The laboratory will use a chain-of-custody to track and document the sample.
- The laboratory will be required to perform sample extractions and analyses within the EPA required holding time for that analysis.
- The laboratory will be required to maintain documentation of all extraction, analysis and reviews of samples.

4.4 Analytical Methods

Analysis of soil, decontamination water, and wipe samples collected in the field will be performed by standard analytical methods. The following Table 1 summarizes the analytical methods; the method reporting limits; and laboratory method detection limits for each analyte, for water and soil, respectively.

Table 1. Summary of Analytical Methods

Analyte	Cleanup Levels (mg/Kg)	Analytical Method	Method Reporting Limit	Method Detection Limit
Soil Samples (mg/Kg)				
PCBs	1	8082	0.05	0.015
Chromium(III)	1000	6010	1	0.17
Chromium(VI)	30	7196	0.5	0.15
Lead	200	6010	10	2.5
Benzo(a)pyrene	2	8270	0.167	0.055
Aqueous Samples (µg/L)				
PCBs	1	8082	0.1	0.03
Wipe Samples (µg/100 cm^2)				
PCBs	10	8082	1	0.1

The selected laboratory will provide QA objectives for these analyses (e.g., surrogate recoveries, matrix spike recoveries, LCS) in the laboratory QAPP to be approved by EPA.

The field personnel will notify the laboratory the same day samples are submitted to the laboratory. Upon receipt of the samples, the laboratory will be required to send a confirmation of receipt to the Field Sampling Project Manager. The laboratory will notify the Field Sampling Project Manager of any errors or deficiencies in the analytical system and the Quality Assurance Manager will be responsible for determining necessary corrective actions.

4.5 Quality Control

4.5.1 Field Quality Control Checks

Field QC checks will be performed through field duplicates, matrix spike samples, and equipment blanks.

Equipment blanks – Equipment blank are collected in the field to ensure that non-dedicated sampling equipment has been effectively cleaned. Equipment blanks will be collected from non-dedicated soil sampling equipment (i.e., trowels) used to collect samples for chemical analysis. Equipment blanks for soil will be collected by rinsing the decontaminated equipment with laboratory supplied rinse water and collecting the rinse water in laboratory supplied sample containers. Equipment blanks will be collected

for samples obtained using non-dedicated equipment at a frequency of 1 per 20 samples per matrix. The equipment blanks for soil will be analyzed for the same parameters as the actual collection samples.

Field Duplicates – Blind Field Duplicate samples are collected to determine analytical precision and sample representativeness. Field duplicates will be collected for chemical analysis of soil, development water, and wipe samples at a frequency of 1 per 20 samples per matrix. Field duplicate samples will be analyzed for the same parameters as the designated sample.

Matrix Spike/Matrix Spike Duplicates – MS/MSD or MS/duplicate samples will be submitted to monitor possible matrix effects specific to samples collected from the site. The addition of known concentrations of compounds/constituents into the sample also monitors extraction/digestion efficiency. One MS/MSD or MS/duplicate per 20 samples per matrix for soil will be collected and submitted for analysis. The MS/MSDs and MS/duplicates will be analyzed for the same parameters as the other samples in that sample set and will allow accuracy to be determined by the recovery rates of compounds.

4.5.2 Laboratory Quality Control Checks

The selected laboratory will be required to run all quality control checks in accordance with those required by the specific EPA analysis methodology and as specified in the Laboratory QA/QC Plan. Laboratory internal QC checks will include:

- Initial calibration verification (ICV) and continuing calibration verification (CCV) samples
- Instrument calibrations
- Initial calibration blanks, continuing calibration blanks, and reagent blanks
- Duplicates
- Instrument detection limit (IDL) determination
- Matrix spike and matrix spike duplicate (MS/MSD) samples
- Laboratory Control Samples (LCS)

The laboratory will be required to document all QA/QC procedures.

LCS for soil will be analyzed for the same parameters and by the same sample preparation procedures as used for samples collected from the site. A minimum of one LCS sample per 20 samples per matrix will be analyzed. LCS results are to be reported in percent recovery and calculated as follows:

$$\% \text{ Recovery} = (\text{measured value}/\text{true value}) \times 100$$

If the percent recovery is outside the specific control limits, the laboratory will cease analyses until the problem is corrected. All samples analyzed with the errant LCS will be re-analyzed by the laboratory. Other QC checks to be conducted as part of the QA/QC program include analysis of equipment blanks, duplicates, matrix spikes and matrix spike duplicates.

4.6 Data Management

4.6.1 Project Documentation and Records

A variety of data records and reports will be generated during the sample collection, chemical analysis, data review, and report process. The types of data include field records and laboratory records, which will be managed as follows:

Field Records – Field records include field notes, logs, forms and data sheets completed in the field, COC Records, and equipment calibration records. These data will be recorded on forms and log books. The field data will be stored in a file box at the field office during the field investigation. At the conclusion of the field activities, copies of the field data sheets and log books will be scanned into a PDF format file and stored electronically onto a file server.

Laboratory Records – The largest amount of data will be generated through chemical analysis of soil, decontamination water and wipe samples. Hard copy and electronic data deliverables will be reported within 14 days after the laboratory receives the last sample per SDG. The laboratory data sets will be checked for completeness. The hard copy will be stored in a file cabinet and electronic data deliverables will be archived onto a file server.

4.6.2 Laboratory Analysis and Data Package Deliverables

The Laboratory will provide an electronic data deliverable.

5.0 ASSESSMENT AND OVERSIGHT

5.1 Assessments and Response Actions

Assessments to be performed during the Phase IV Remedial Action include onsite audits and management system reviews.

Onsite Audits – At least one onsite audit will be performed to verify that field activities are performed in accordance with established procedures. The field audit will be performed by the Project QA Officer and will include the verification of the following elements:

- Completeness and accuracy of sample COC forms
- Completeness and accuracy of sample labels
- Completeness and accuracy of field notebooks and sampling forms
- Adherence to sample collection, preparation, preservation and storage procedures
- Procedure verification of field screening practices
- Adherence to the Site Specific Health and Safety Plan
- Adherence to decontamination procedures as outlined in the SAP

QC sample results will be evaluated immediately after receipt so that any deficiencies or errors can be addressed immediately. If analytical results for control samples exceed warning limits, the data will be accepted, but the source of the problem will be evaluated immediately to determine if modifications or repairs are necessary. If control samples are outside control limits, then the source of the problem must be identified and remedied before work can continue. If necessary, samples will be re-run.

Problems encountered as part of the field program audits, laboratory audits, or analytical problems will be reported on a Corrective Action Form. Any errors or problems identified will be corrected by an appropriate action, which may include:

- Replacing or repairing the faulty measurement system
- Discarding erroneous data
- Collecting new data
- Accepting the data and acknowledging the level of uncertainty

5.2 Reports to Management

The Project QA Manager, in conjunction with Project Manager will prepare progress report summaries of applicable quality assurance activities as they occur. The reports will provide information on the performance measurement systems and data quality and may include the following:

- Results of performance or system audits;
- Results of data quality assurance reviews, including assessment of accuracy, precision, completeness, and representativeness;
- Status of laboratory and field quality assurance project activities;
- Significant quality assurance problems discovered, corrective actions taken, and proposed modifications; and
- Significant field observations noted in the field notebook.

6.0 DATA VALIDATION AND USABILITY

6.1 Data Review, Verification, and Validation

All Phase IV analytical data and QC data will be critically reviewed to look for problems that may compromise the data usability. The *USEPA National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.2) OSWER 9355.0-132 EPA 540-R-014-002 August 2014* and *USEPA National Functional Guidelines for Inorganic Superfund Data Review (ISM02.2) OSWER 9355.0-131 EPA 540-R-013-001, August 2014* documents will be used as a guideline for evaluating the analytical results from this remedy. A detailed data evaluation will only be performed on confirmation samples collected to document that the clean-up standards for the site have been achieved.

The laboratory deliverables for confirmation samples will be evaluated for completeness to ensure that the QA/QC samples have been collected and analyzed in accordance with this QA/QC Plan. Data validation will be performed mainly using the laboratory narrative, QC data provided with the package, and COC Records.

A brief data evaluation report will be prepared for each SDG documenting the results of this assessment and verification. Copies of data packages and data validation reports will be retained for a period of five years.

6.2 Reconciliation with User Requirements

This section describes how the validated project data will be reconciled with the PQOs and includes a summary of the proposed methods to evaluate the data and report the results of the data quality review.

The validated soil data will be tabulated using spreadsheet software (Microsoft Excel or similar). Someone other than the person who prepared the tables will crosscheck data tables for errors. A review of the data will be performed to determine whether the data meet the overall PQOs and, therefore, can be used for environmental decision making. During this stage, the data are evaluated for the following issues:

- Correct sampling and analytical methods
- Required analytical deliverables
- Data evaluation and verification in accordance with this QA Plan
- Comparison with completeness goals
- Representativeness of the data

Data that is determined to be usable based on the data evaluation and comparison with PQOs will be used to address decisions that need to be made under the Phase IV RIP. The Permanent Solution Statement will contain an assessment of data quality and usability. The report will include a summary of data qualified during validation, identification of potential laboratory and field contaminants, review of detection limits, and a statement regarding data completeness.

7.0 REFERENCES

EPA Region 1, July 3, 1991, Region I Complete Sample Delivery Group Files (CSF) Completeness Evidence Audit Program.

EPA, March 2001, EPA Requirements for Quality Assurance Plans, EPA QA/R-5 (EPA/240/B-01/003)

EPA Region 1, December 1996, Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses.

USEPA National Functional Guidelines for Superfund Organic Methods Data Review (SOM02.2) OSWER 9355.0-132 EPA 540-R-014-002 August 2014.

USEPA National Functional Guidelines for Inorganic Superfund Data Review (ISM02.2) OSWER 9355.0-131 EPA 540-R-013-001, August 2014.

Figures

Wooded Hillside

Excavate to 24"
(1,287 CF)

C

130'

PCBs >50 @9"
excavate to 18"
(320 CF)

A

Excavate to 24"
(22,913 CF)

D

PCBs >50 @12"
excavate to 21"
(1,272 CF)

A

B

TCLP Pb >5
excavate to 6"
(20 CF)

A

PCBs >50 @12"
excavate to 21"
(200 CF)

E

Excavate to 18"
(1,790 CF)

Residence
(37 Prospect Ave.)
(RTN 4-24815)

Dirt Floor
Patio Area

Paved
Driveway

95'

Grass Strip

Concrete

Building

Slab A

Slab B

Shed

Antenna

UP-Antenna

UP-Electric

UP

Estimated location of subsurface electrical conduit

Estimated location of subsurface electrical conduit

Estimated location of subsurface electrical conduit

PROSPECT AVENUE
Paved Roadway

Residence
(41 Prospect Ave.)

LEGEND

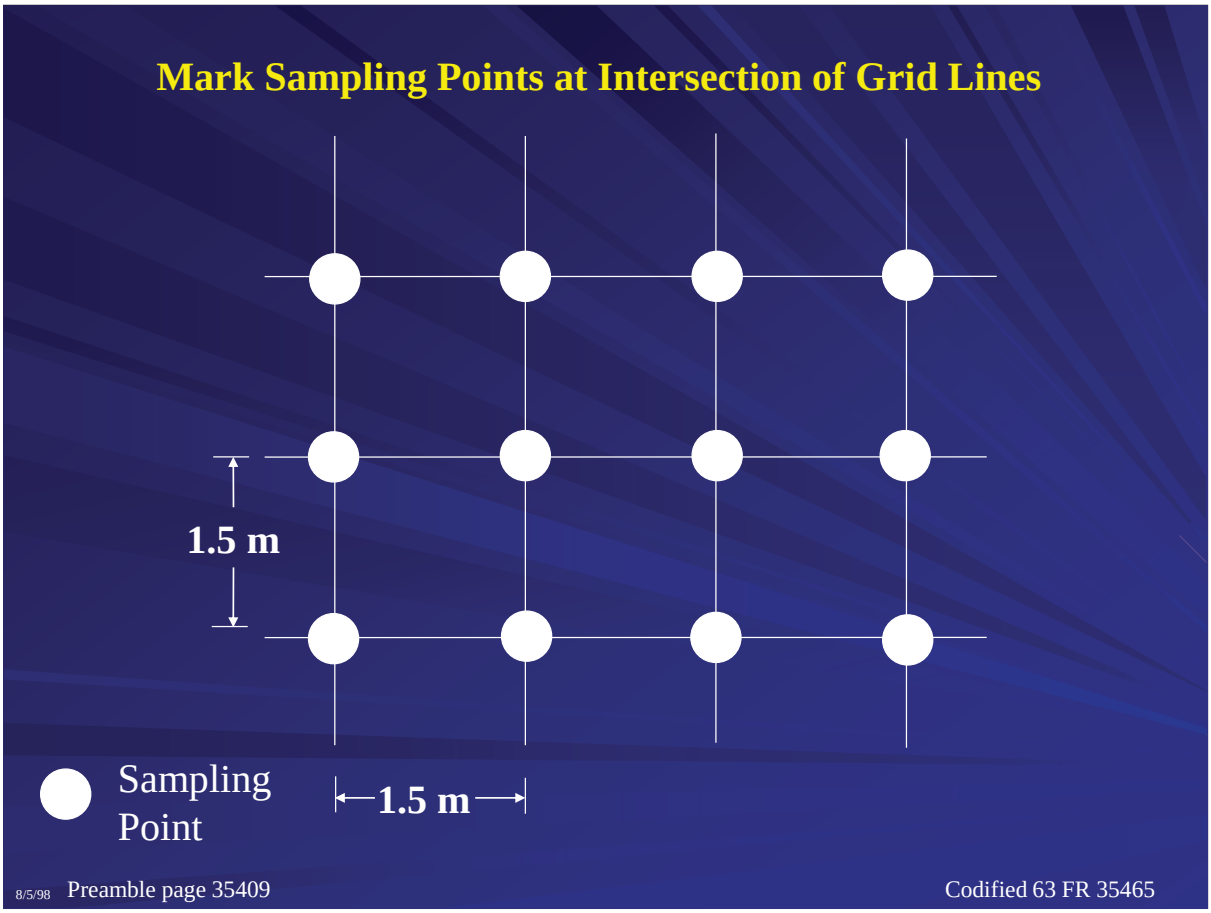
- Soil Sample Location - 0-3' PCBs Non-Detect
- Soil Sample Location - 0-3' PCBs <1 mg/kg
- Soil Sample Location - 0-3' PCBs >1, <50 mg/kg
- Soil Sample Location - 0-3' PCBs >50 mg/kg
- Green Outline: ND at surface, at depth >3', PCBs <1 mg/kg
- Blue Outline: at depth >3', PCBs >1, <50 mg/kg
- Red Outline: at depth >3', PCBs >50 mg/kg
- Samples without Outline at depth >3', PCBs <1 mg/kg or ND
- Area of materials to be excavated and disposed of as TSCA Waste to Model City Landfill, NY. Excavation depth and estimated quantity listed.
- Area of materials to be excavated and disposed of to Turnkey Landfill, NH. Excavation depth and estimated quantity listed.
- Fence Line (6' high chain link fence w/ barbed wire)
- Site Limit
- Concrete Blocks (Tank Foundation)
- Manhole
- Hydrant
- Utility Pole
- Boulders

Figure 1

Site Disposal Areas

Former Strawberry Hill Tank Site
Hull, Massachusetts

Environmental Partners GROUP
A partnership for engineering solutions.
Quincy, MA www.envpartners.com



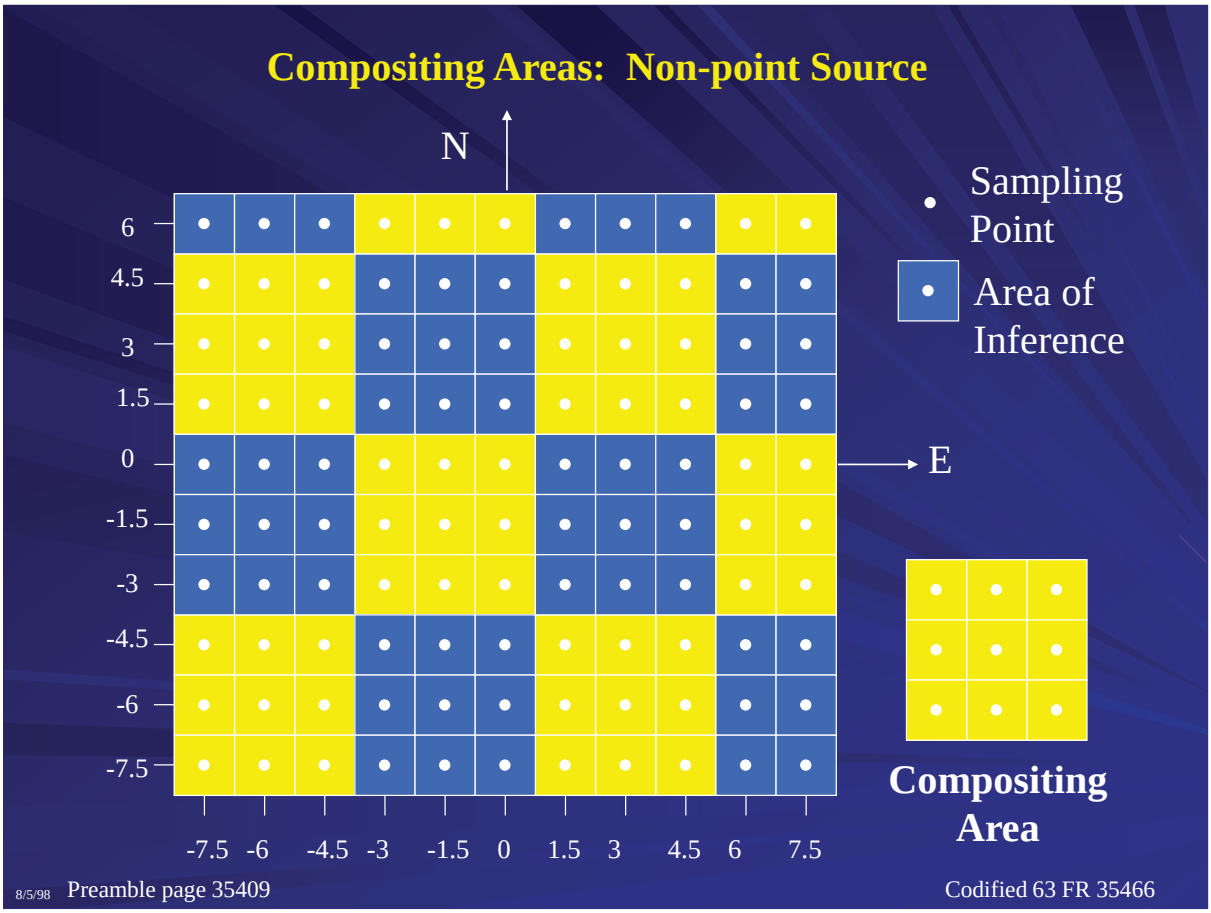


Figure 2. Confirmatory Soil Composite Sampling Methods